Winsten Day 2011 Abstracts

Afternoon Lectures

Optimisation
Dr John Ford
Department of Mathematical Sciences
University of Essex

Many problems that arise in engineering, computing, economics, biology, etc., etc. can basically be described as optimisation problems - that is, they ask for a maximum or a minimum. For example: -

- the greatest
- the heaviest
- the smallest
- the closest

In fact, the great mathematician Leonhard Euler is supposed to have said: -

"Nothing at all takes place in the universe in which some rule of maximum or minimum does not appear".

Examples:

- Develop a production plan to give the greatest profit
- Design a structure which will hold up the heaviest load
- Build a car with the least wind resistance
- Find a simple formula that is closest to the given data

In this talk, we will introduce some of the kinds of optimisation problems that appear in real life and see practical techniques which can be used to solve them.

The shortest distance between two points separated in space and time

Dr Andrew Harrison
Department of Mathematical Sciences
University of Essex

The shortest distance between two points on a flat plane is a straight line. If a person stands still they do not move through space but they do move through time. If a person moves at a constant speed to another position then they will move in a straight line through space and time.

But what happens to the space-time geometry when an object is free-falling? And why do free-falling objects feel weightless? Find out why Albert Einstein described his insight into how these two questions are related as the "Happiest thought of his life".

Pythagorean Triples

Prof. Peter Higgins
Department of Mathematical Sciences
University of Essex

Later today you will hear Simon Singh's talk on Fermat's Last Theorem that says that the sum of two cubes is never a cube, two fourth powers never add to another fourth power, and so on. But what about the $n = 2$ case? When do two squares add to another square?

This is called the Pythagorean Triples Problem because each solution gives you a right-angle triangle with whole number sides: eg (3,4,5), (5,12,13) . In this little talk I will show you how to get all the solutions and prove to you that there are not any more. The set of all Pythagorean triples is infinite but can be completely described quite easily.

The Joy of Stats at Essex
Dr Berthold Lausen
Department of Mathematical Sciences
University of Essex

The talk introduces three examples to explain the use of statistics as field of the mathematical sciences.

In a recent BBC4 program 'The joy of stats' Prof. Hans Rosling illustrated that statistics tackle important questions in many fields and disciplines. We start with "Hans Rosling's 200 Countries, 200 Years, 4 Minutes" to investigate data on the average national life expectancy and average income per person of 175 countries. How can we predict the average life expectancy of the UK using the national income of the UK? Can we predict the life expectancy in the year 2030 or 2050? How reliable is such a prediction?

What is the contribution of statisticians to research questions how one can help children, adolescents and adults to improve their life styles? A typical role of a statistician is to join a team of researchers, which plans, runs and analyses a study to investigate for example, if outdoor learning programmes improve children's emotional and social well-being, or if workplace interventions to promote active commuting improve the physical activity of employees. Both examples are planned projects lead by researchers of the Department of Biological Sciences of the University of Essex.

We use data of the European Social Survey to describe how the daily use of media, TV watching, Radio listening, Newspaper reading and using the web has changed between 2002 and 2008. What are the age and gender differences?

In summary the three examples illustrate the importance of statistical methods to inform and to guide decision making in various jobs and society.

Further information:
- 'The joy of stats' by Prof. Hans Rosling: www.open.ac.uk/openlearn/whats-on/the-joy-stats
- Green exercise research programme at Essex: www.greenexercise.org/
- The European Social Survey (ESS): http://www.europeansocialsurvey.org/